Madison Public Schools

sTEAm Grade 5 - Innovative Designer - part B

Unit Focus

The arts provide means for individuals to collaborate and connect with others in an enjoyable inclusive environment as they create, prepare, and share artwork that bring communities together. In this unit, the students will collaborate as they use an iterative process, through engineering design, to create a paper vehicle that is powered via technology. The students will then run their vehicles through a course to see whose design can survive the rigors of the track.

Stage 1: Desired Results - Key Understandings

Standard(s)

CSTA: Computer Science Standards (2017-)
CSTA: 3-5

- Algorithms & Programming *(1B-AP)*
  - Decompose (break down) problems into smaller, manageable subproblems to facilitate the program development process. *(1B-AP-11)*
  - Modify, remix, or incorporate portions of an existing program into one's own work, to develop something new or add more advanced features. *(1B-AP-12)*
  - Use an iterative process to plan the development of a program by including others' perspectives and considering user preferences. *(1B-AP-13)*
  - Test and debug (identify and fix errors) a program or algorithm to ensure it runs as *(1B-AP-15)*
  - Describe choices made during program development using code comments, presentations, and demonstrations. *(1B-AP-17)*

National Core Arts Standards
Visual Arts: 5

- Investigate, Plan, Make: Generate and conceptualize artistic ideas and work. *(VA:Cr1.1.5)*
  - Combine ideas to generate an innovative idea for art-making. *(VA:Cr1.1.5.a)*

Transfer

Students will be able to independently use their learning to...
T1 Work together on a common goal to meet deadlines through addressing challenges and problems along the way both individually and collectively.

Meaning

Understanding(s)

Students will understand that...
U1 Complex problems can more easily be solved by breaking them down in smaller components and solving for those.
U2 Collaboration with others can improve product creation by incorporating different perspectives in the final design.
U3 Programmers debug and revise their programs to improve the stability of the program.
U4 A deliberate design process can be used for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.

Essential Question(s)

Students will keep considering...
Q1 How do designers create products that effectively communicate?
Q2 How do designers learn from trial and error?
Q3 How does collaboratively reflecting on a design help us experience it more fully and develop it more completely?

Acquisition of Knowledge and Skill

Knowledge

Students will know...
K1 Engineers couple creativity and imagination with analytical skills to solve problems.
K2 Use basic terminology of block coding: loop,

Skill(s)

Students will be skilled at...
S1 Using blocks that contain a loop, conditional, and/or variable.
S2 Using block coding to create a solution to a

Stage 1: Desired Results - Key Understandings

- Identify and demonstrate diverse methods of artistic investigation to choose an approach for beginning a work of art. *(VA:Cr1.2.5.a)*
- Investigate: Organize and develop artistic ideas and work. *(VA:Cr2.1.5)*
  - Demonstrate quality craftsmanship through care for and use of materials, tools, and equipment. *(VA:Cr2.2.5.a)*

Next Generation Science Standards (content standards)
Elementary Standards: 5

- Engineering Design *(3-5-ETS1)*
  - Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. *(3-5-ETS1-1)*
  - Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. *(3-5-ETS1-2)*
  - Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved. *(3-5-ETS1-3)*

Next Generation Science Standards (DCI)
Science: 5

- ENGINEERING, TECHNOLOGY & APPLICATIONS OF SCIENCE
  - Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.

conditional, variables, nesting, bugs, and debugging.
K3 A chassis is the base frame of a wheeled conveyance.
K4 Mechanical engineering is the branch of engineering dealing with the design, construction, and use of machines.

problem.
S3 Creating working models from reused materials.
S4 Using a ruler to assistant in a mechanical engineering design.
S5 Using the design process to create a model.

Stage 1: Desired Results - Key Understandings		
(ETS1.5.A1) ○ Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. *(ETS1.5.B1)* ○ At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. *(ETS1.5.B2)* ○ Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. *(ETS1.5.B3)* ○ Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. *(ETS1.5.C1)* **Student Growth and Development 21st Century Capacities Matrix** *Creative Thinking* • Design: Students will be able to engage in an appropriate process to refine their product. *MM.2.3* *Collaboration/Communication* • Collective Intelligence: Students will be able to work respectfully and responsibly with others, exchanging and evaluating ideas to achieve a common objective. *MM.3.1* *Global Thinking* • Alternate Perspectives: Students will be able to interpret or critique complementary and competing approaches, experiences, and worldviews. *MM.5.2*		